REMARKS

Claims 1, 3-5 and 7-10 are pending in the application.

CLAIM REJECTIONS

Claims 1 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Öttle in view of Dunster and Ravault. This rejection is respectfully traversed.

The subject matter of claims 1 and 7 would not have been obvious over Öttle, Dunster and Ravault, whether considered alone or in combination. The cited references, alone or in combination, do not disclose or suggest all limitations of independent claims 1 and 7. Öttle, Dunster and Ravault fail to disclose or suggest "a metallic basket suitable for operation at elevated temperatures inside the reactor shell," much less "a metallic basket . . . wherein the basket further comprises a fixed catalyst bed comprising particles or a monolith active in catalytic partial oxidation of hydrocarbons, said fixed catalyst bed being supported by said bottom and surrounded by said metallic sidewalls," as in the claimed invention. Öttle does not disclose a basket, i.e., a structure that "resembles a basket in shape or function" (as defined in the American Heritage Dictionary, 2d college Ed.). Catalyst carrier 22 of Öttle is not a "basket" as defined and known in the art.

More importantly, catalyst carrier 22 of Öttle is not "a metallic basket . . . comprising an inlet channel, metallic sidewalls, and a bottom opposite the inlet channel and extending in a direction transverse to the inlet channel," as claims 1 and 7 recite. The bottom of the catalyst carrier 22 of Öttle is not located "in a direction transverse to the inlet channel" (as in the claimed invention) but rather in a direction parallel to the inlet channel. Further, catalyst carrier 22 of Öttle does not have "an inner surface of the metallic basket . . . coated with a ceramic material," as claim 1 recites.

In the Office Action dated October 30, 2007, the Examiner asserts that "Öttle discloses . . . an impermeable basket in the form of a metallic foil 30 that surrounds the sidewalls of the catalyst bed." (October 30, 2007 Office Action at 2). Applicants disagree. Foil sheets 30, 32 of Öttle do not -- and cannot -- form "a metallic basket," as in the claimed invention. Öttle teaches that

each end of the catalyst carrier 22 "is covered by a foil sheet 30, 32" and that "these sheets are overlapped centrally" and that they "are also secured to a ring 34, 36" (col. 2, ll. 62-68; col. 3, ll. 1-5). However, sheets 30, 32 of Öttle do not form a basket, much less "a metallic basket . . . comprising an inlet channel, metallic sidewalls, and a bottom opposite the inlet channel and extending in a direction transverse to the inlet channel," as in the claimed invention.

Dunster and Ravault do not rectify the deficiencies of Öttle. None of these references disclose "a metallic basket" as defined by a person skilled in the art and as recited in claims 1 and 7 (i.e., "a metallic basket . . . comprising an inlet channel, metallic sidewalls, and a bottom opposite the inlet channel and extending in a direction transverse to the inlet channel").

Applicants also submit that a person skilled in the art would not have been motivated to combine Öttle with Dunster, as the Examiner asserts. The reactor of Öttle provides a cheap exhaust gas purification device which has two sheets of thin foil only, one being fixed between shell and an inlet flange, and the other only between shell and an outlet flange, and both surrounding a catalyst body. A person of ordinary skill in the art would not have been motivated to modify the reactor of Dunster so that only an inlet channel is sealed to reactor shell hindering feed gas to enter an insulating layer and thereby by-passing a catalyst, and so that the basket has bottom which supports a catalyst bed, and so that there is no outlet channel ensuring operating pressure on both outer side and inner side of the basket and ensuring that no gas will by-pass the catalyst and at the same time ensuring that outer pressure shell is designed for full pressure (and low temperature) and basket is designed for full temperature (and low pressure).

A skilled person would also not have been motivated to change the reactor of Öttle with the reactor of Dunster, to exclude the outlet channel, as this is the only channel in that reactor.

In addition, a person skilled in the art would not have been motivated to modify the reactor of Dunster with the reactor of Öttle to arrive to the claimed reactor with a gas tight connection between an inlet channel and outer pressure shell, as Dunster has no inlet channel for the hydrocarbon/oxygen gas feed and Öttle has no particulate catalyst, no catalyst support, and no

catalyst bed support for a particulate catalyst bed. To combine Öttle with Dunster, to arrive at the reactor of claimed invention, is pure hindsight.

Applicants also submit that the reactor of Ravault cleans exhaust gas and comprises an outer shell, and insulating layer (sleeve) and a ceramic porous body (catalyst). The porous body can be provided with impermeable ceramic sidewalls (col. 4, ll. 12-15), which may be glazed (col. 4, ll. 15-17). The porous body is not surrounded by any metallic wall, but is directly inserted into the sleeve of insulating material (col. 3, l. 55 – col. 4, l. 1). Thus, the reactor of Ravault will not suggest to a person of ordinary skill in the art to coat the inner side of an already gas tight metallic basket with a ceramic layer, which even may be a catalytic ceramic layer.

Applicants additionally submit that Öttle discloses a device for purifying exhaust gases of an internal combustion engine. The device comprises a shell and a catalyst body with a foil (thin sheet, not a basket) around it. The foil is secured by a ring (reference 34 in Fig 1, column 3, line 4). Such a device is typically installed in vehicles, horizontally installed, and is not large. The catalyst body comprises catalyst filled passages (column 2, lines 64, 65), i.e., one stiff body with channels and with catalyst inside the channels. The reactor of the claimed invention is suitable for catalytic partial oxidation (CPO) of hydrocarbons. This is known to a person of ordinary skill in the art to be an industrial process for producing synthesis gas, which is used for producing for example hydrogen, ammonia and methanol. Thus, large reactors operating at elevated temperatures and pressures are involved (see Exhibit A submitted with the August 15, 2007 Amendment). Accordingly, a person of ordinary skill in the art would not find it obvious (and would not have been motivated) to select a small device for purification of an exhaust gas and exchange the catalyst body with the catalyst of Dunster, to obtain the large industrial reactor for CPO of the claimed invention.

The foil itself in the reactor of Öttle is totally impermeable, even though it is thin. To add the layer of glaze of Ravault will neither make it more impermeable nor make it as mechanically strong as needed in the reactor of present invention. Accordingly, it would not have

been obvious for a person having ordinary skill in the art to arrive at the reactor of present invention from the combination of Öttle, Dunster and Ravault.

For at least the reasons above, the Office Action fails to establish a *prima facie* case of obviousness, and withdrawal of the rejection of claims 1 and 7 is respectfully requested.

Claims 3-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Öttle in view of Dunster and Mentschel. This rejection is respectfully traversed.

Mentschel discloses a reactor for producing fuel for a combustion engine (col. 2, l. 47). The feed gas is heated by the product gas (Fig. 2; col. 6, ll. 41-44). In the vertical middle of this reactor, an outer wall 101 forms a recess 105 (Fig. 2; col. 6, l. 30). The recess 105 surrounds a post 113 (col. 6, l. 30; Fig. 2). In the recess, a heater may be inserted (col. 7, ll. 25-26). This means that the heater is installed outside the outer wall 101 and this is not installed inside the reactor. Further, the heater heats the gas, which has already to some extent been heated by the catalyst effluent gas. Thus, the reactor of Mentschel will not motivate a person skilled in the art to install a heater inside a reactor pressure shell, as in the reactor of claimed invention.

Applicants submit that Mentschel discloses a reactor for converting hydrocarbons, the reactor comprising catalyst beds surrounded by an outer wall, reference 101 in Fig 2 (column 6, line 28). Even though unclear (some typing errors are present), column 6, lines 27-32 together with column 7, lines 25, 26 and Fig. 2 state that outer wall 101 forms a recess 105 (and that in the recess can be placed a post 113, and that in the recess 105 a supplemental electric heater can be also accommodated). On the other side of the outer shell – compared to the recess with a heater – the catalyst is installed (i.e., inside the reactor), which means that the heater is installed outside the reactor. Thus, Mentschel does not suggest to a person of ordinary skill in the art to install a heater inside a reactor and, thereby, also not to apply a catalytic coating on the same position, on the inner side of a basket.

For at least the reasons above, the Office Action fails to establish a *prima facie* case of obviousness, and withdrawal of the rejection of claims 3-5 is also respectfully requested.

Claims 8 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Öttle in view of Dunster and Hahn. This rejection is respectfully traversed.

Hahn discloses a process for purification of bromine and mentions removing hydrocarbons by heating to 1000°C and adding oxygen to oxidize the hydrocarbons (col. 1, ll. 49-56). This aims to fully oxidize the hydrocarbons (col. 2, ll. 56-57). This is in contrast to the partial oxidation of hydrocarbons in the claimed invention and, thus, the process of Hahn cannot be compared to that of the claimed invention. Hahn suggests no optimal temperature for a partial oxidation reaction.

Hahn also describes that hydrocarbon impurities in bromine can be oxidized by oxygen at above 1000°C (column 1, lines 52-57), with no catalyst present. Contrary to this, the reaction of the claimed invention is a catalytic partial oxidation, also called autothermal reforming (see Exhibit A submitted with the August 15, 2007 Amendment). This means that not only is some of the hydrocarbons oxidized to water and carbon oxide, but simultaneously the rest (i.e., a considerable part) of the hydrocarbons are converted to hydrogen and carbon monoxide in the presence of a catalyst. The optimal temperature for catalytic partial oxidation would therefore not be obvious to a person of ordinary skill in the art from the full oxidation of hydrocarbons as mentioned by Hahn.

For at least the reasons above, the Office Action fails to establish a *prima facie* case of obviousness, and withdrawal of the rejection of claims 8 and 9 is also respectfully requested.

Claim 10 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Öttle in view of Dunster and Werges. This rejection is respectfully traversed.

Werges discloses a reactor, wherein a liquid enters at the bottom and flows upwards (col. 5, ll. 42-44, Fig. 7) through a catalyst bed supported by a grid (ref. 63 in Fig. 7; col. 6, l. 14). In Fig. 7, Werges discloses a reactor with a liquid up-flow with inert material supported by a grid (Fig 7, ref. 63; column 5, lines 42-44). Maximum load on the grid occurs during stand-still, where the grid supports the entire weight of the inert material. Contrary to this, in the reactor of the claimed invention, gas flows downwards through a catalyst bed, and the catalyst support must be designed

for the entire weight of the catalyst bed plus the pressure drop created by the gas flowing down through the catalyst bed. Thus, a person of ordinary skill in the art would not have been motivated to look at the support of Werges when choosing a catalyst support for the reactor of the present invention.

For at least the reasons above, the Office Action fails to establish a *prima facie* case of obviousness, and withdrawal of the rejection of claim 10 is respectfully requested.

RESPONSE TO EXAMINER'S COMMENT

Applicants address below Examiner's comments with respect to Applicants' arguments regarding the rejection of claims 1, 3-5 and 7-10, as set forth in the October 30, 2007 Office Action, and in the order presented on pages 5-8 of the October 30, 2007 Office Action:

1) (A) Exhibit A, line 1 describes that steam reforming process catalytically convert hydrocarbons to hydrogen and carbon oxides.

Exhibit A, lines 15-16, states that a special type of steam reforming is autothermal reforming also called catalytic partial oxidation.

B) Exhibit A, lines 19-20, states that CPO can be conducted at even higher pressures than in a tubular reformer.

Yoshida et al. disclose a pressure range of 0-150 kg/cm^{2}g (0-15 MPa) in claim 4 and 30-100 kg/cm^{2}g (3-10 MPa) in claim 6 and describes that 30-100 kg/cm^{2}g is the especially preferred pressure range (column 4, line 62).

2) The catalyst body of Öttle, shown as being horizontal, rests on the foil being supported by insulation and outer shell. The exhaust gas flows horizontally through the catalyst filled passages of the catalyst body. Rings 34 and 36 keep the foil in position (column 3, line 4). Contrary to this, in a CPO reactor as shown in the sole figure of the application of the claimed

invention, the bed with catalyst pellets rests on the bottom of the basket, and the gas flows out through this bottom. This means that the gas flows out through the support of the catalyst bed, in contrast to the flow in the reactor of Öttle.

3) The catalyst of Öttle has a structure of a catalyst body comprising catalyst filled flow passages (column 2, lines 64, 65), which together with the figures indicate that the gas flows in channels. Fig 4 indicates that the foil does not necessarily extend along the entire length of the catalyst body.

The present invention is concerned with avoiding gas leaking to the insulation at any place in the reactor upstream of the bottom of the basket (page 4, lines 3, 4).

4) For reasons given above, the reactor of Öttle would not inspire a person having ordinary skill in the art to arrive to the reactor of present invention.

5) The foil of Öttle is fully impermeable. Another layer is not necessary for this purpose. The ceramic layer of claimed invention is permeable and provides thermal insulation between hot gas and basket.

The glaze of Ravault does not inspire a person having ordinary skill in the art to arrive to the alumina or zirconia on the inner side of the basket of the present invention.

6) Mentschel discloses a reactor with an outer wall 101 (column 6, line 28). Outer wall 101, which is a pressure shell, contains the catalyst and a number of partitioning walls 108 (column 6, line 36).

Anything outside outer wall 101 is outside the reactor, even when 101 forms a recess. A heater in a recess is still outside the reactor, as it is on the other side of the outer wall compared to the catalyst, which is inside the outer wall 101.

7) The oxidation mentioned by Hahn is an oxidation reaction of hydrocarbons to water and carbon dioxide (column 1, lines 52-57).

The reaction of present invention is a CPO which (as shown in Exhibit A submitted with the August 15, 2007 Amendment) is an autothermal steam reforming, where the main part of hydrocarbons are reformed to hydrogen and carbon oxide and the heat for this endothermic reaction is supplied by oxidation of the rest of the hydrocarbons and in the presence of a catalyst.

These two -- so different -- reactions cannot be expected to have the same optimal reaction temperature range.

8) Werges discloses a reactor with a liquid up-flow through a grid, meaning that the maximal load on this grid is the weight of the inert material resting on it (column 6, line 54).

As described above, the support for a catalyst bed with down flow must also be designed to withstand the pressure drop created by the gas flowing down through the catalyst bed.

Allowance of all pending claims is solicited.

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Respectfully submitted,

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